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Need for Recovery in the Working Population: Description and Associations With Fatigue and Psychological Distress

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This study examined the concept of need for recovery, that is the need to recuperate from work-induced fatigue, experienced after a day of work. The study explored the relationship between need for recovery from work, prolonged fatigue, and psychological distress in the working population. A cross-sectional study was carried out. Data of the Maastricht Cohort Study on fatigue at work were used (n = 12,095). Some degree of need for recovery was found in nearly all employees. Need for recovery from work was associated with demographic, work-related, and health factors. Principal Components Analysis revealed obvious separation between need for recovery items and both fatigue items and psychological distress items, supporting the notion that need for recovery, fatigue, and psychological distress represent different underlying concepts. Although need for recovery, fatigue, and psychological distress were frequently comorbid, they also clearly occurred as separate entities.

Keywords: need for recovery, fatigue, psychological distress, work

One of the most important factors influencing the physical and mental condition of an employee, and thus his or her ability to cope with work, is the degree to which employees are able to recover from fatigue and stress at work (De Vries-Griever, 1992).

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Recovery can be defined as the period of time that an individual needs to return to a normal or prestressor level of functioning following the termination of a stressor (Craig & Cooper, 1992). In line with this definition, the work-induced stressor level and subsequent recovery are determined by many work-related factors such as workload (Milosevic, 1997; Saito, 1999), overtime work (Saito, 1999), and deviating working hours (De Vries-Griever, 1992). Returning to a normal or prestressor level of functioning after work is influenced by numerous individual factors, such as coping strategies (Wessely, 1990), and health status and private situation (Galambos & Walters, 1992). Besides work-related factors and individual characteristics, the actual period of time available to recover from work is important. It has been suggested that the time required to recover from a stressor may be a better measure of the severity of stress and a better predictor of the likelihood of long-term chronic effects than the immediate response to a stressor (Depue & Monroe, 1986).

In line with these findings on recovery, the concept of need for recovery from work was introduced (Meijman, 1989; Sluiter, Frings-Dresen, Van der Beek, & Meijman, 2001; Sluiter, Van der Beek, & Frings-Dresen, 1999; Van Veldhoven & Meijman, 1994), which was defined as the need to recuperate from work-induced fatigue, primarily experienced after a day of work. The concept involves the intensity of work-induced fatigue, both mentally and physically, as well as the time period required to return to a normal or prestressor level of functioning. A related concept to recovery was introduced by Glass and Singer (1972), who demonstrated that the outcome of exposure to prolonged stress, such as that experienced at work, may be best observed in various effects, including irritability, that occur after exposure to the stressor is terminated (Melamed & Bruhis, 1996). This "postwork irritability" is for example recognizable by feelings of wanting to be left alone for a while after work, or being bothered by noises around you (Melamed & Bruhis, 1996), feelings that appear similar to the need for recovery after work. High levels of postwork irritability or need for recovery can result in unfavorable implications on the quality of life after work and can jeopardize the chances of employees to unwind and relax after work (Melamed & Bruhis, 1996). Repeated insufficient recovery from work-induced fatigue is seen as the start of a vicious circle where extra effort has to be exerted at the beginning of every new working period to rebalance the suboptimal psycho-physiological state, and to prevent performance breakdown (Meijman, 1989; Sluiter et al., 1999). The accumulated fatigue from repeated insufficient recovery is related to health problems (Meijman, 1989; Van der Beek, Meijman, Frings-Dresen, Kuiper, & Kuiper, 1995) and sick leave and work disability (Schröer, 1997). Need for recovery is considered relevant as a mediating or moderating characteristic in the etiology of fatigue (Kant et al., 2000). Lewis and Wessely (1992) argued that fatigue should not be regarded as a discrete disorder, but as a continuum ranging from mild, frequent complaints seen in the community to the severe, disabling fatigue characteristics of burnout, overstrain, or chronic fatigue syndrome. Perhaps need for recovery should be located at the very beginning of this continuum, constituting a possible

precursor of prolonged fatigue or psychological distress. If so, then need for recovery could be used to study the onset of fatigue and subsequent sick leave in general and to investigate the effects of different work and rest schedules in particular. However, so far the relationship between need for recovery and other concepts, like prolonged fatigue and psychological distress, is relatively unknown.

The purpose of this study was to further gain insight into the concept of need for recovery and to explore its relationship with outcomes, such as prolonged fatigue and psychological distress, in the working population. In 1998, a large-scale prospective cohort study on fatigue at work was started in the Netherlands (Beurskens et al., 2000; Kant et al., 2000). In this Maastricht Cohort Study, the employee's need for recovery constitutes one of the outcome parameters. The Need for Recovery scale was derived from an existing Dutch questionnaire on psychosocial job demands and job stress (VBBA; Van Veldhoven & Meijman, 1994) and represents short-term effects of a day of work.

First, a description of need for recovery from work in the Maastricht Cohort Study was made, including the association between need for recovery and demographic, work-related, and health factors. Second, the scale was compared with instruments representing prolonged fatigue and psychological distress, the Checklist Individual Strength, and the General Health Questionnaire-12, respectively.

METHODS

Study Population

For the purpose of this study the data at baseline from the Maastricht Cohort Study were used. The Maastricht Cohort Study surveys a large heterogeneous population of employees from 45 different companies and organizations and follows them for three years (Beurskens al., 2000; Kant et al., 2000). Companies were invited by the researchers to participate in the study. Invitation was based on company size and sector/trade to establish a representation of the Dutch working population. The baseline questionnaire was mailed to the employees in May 1998. Inclusion criteria were age 18–65 years and a minimum employment of 50%. Temporary employees were excluded because they generally change jobs frequently (Kant et al., 2000). At baseline, both exposure and outcome are measured on an individual level by means of a self-administered questionnaire, which covers about 220 questions on work, private situation, individual characteristics, need for recovery, fatigue, and psychological distress. The response rate was 45%. Altogether 12,161 employees responded to the baseline questionnaire, a total of 66 questionnaires were excluded from analysis because of technical reasons or because inclusion criteria were not met, resulting in a final study population of 8,840 men and 3,255 women (n = 12,095). Nonresponse analyses yielded no significant differences between respondents and

nonrespondents regarding demographic characteristics. Nonrespondents were somewhat less likely to report fatigue complaints, sick leave, and difficulties in work execution. Further details about the baseline questionnaire and nonresponse analyses have been reported elsewhere (Bültmann, Kant, Kasl, Beurskens, & Van den Brandt, 2001; Janssen, Nijhuis, & Beurskens, 2001; Kant et al., 2000).

Measures

Need for Recovery. The Need for Recovery scale was derived from an existing Dutch questionnaire on the experience and assessment of work (VBBA; Sluiter et al., 1999; Van Veldhoven, & Meijman, 1994). The scale contains 11 dichotomous items, representing short-term effects of a day of work. All variables were recoded in such a way that higher scores meant "more complaints," in other words more need for recovery. The total score ranges from 0–100. The Cronbach's α of the entire scale is 0.78. There is no existing cutoff point for the scale to classify "cases" with very high scores on the scale. Therefore, in the present study the upper quartile was used to define a contrast between employees with and without considerable need for recovery from work.

Checklist Individual Strength (CIS). The CIS was used to measure prolonged fatigue. The CIS is a 20-item questionnaire developed to measure several aspects of prolonged fatigue. Whereas the items of the Need for Recovery scale are concerned with the recuperation period after one day of work and represent short-term effects, the items of the CIS represent prolonged fatigue, asking employees how they felt during the past two weeks. The CIS is a self-report instrument consisting of four factors: subjective experience of fatigue, concentration, motivation, and physical activity level. Items of the Need for Recovery scale, in contrast, are related to the time spent after work in terms of recuperation need. Items of the CIS are scored on 7-point Likert scales. Higher scores indicate a higher degree of fatigue, more concentration problems, reduced motivation, or less activity. A composite CIS-total score, ranging from 20–140, can be constructed by adding the individual's scores on the four factors. The psychometric properties of the CIS are good (Vercoulen et al., 1994). Based on receiver operating characteristic analysis, a CIS-total cutoff point of > 76 was derived for use in the working population (Bültmann et al., 2000). Employees scoring > 76 were designated as probable cases of prolonged fatigue.

General Health Questionnaire (GHQ–12). Psychological distress was measured by the 12-item General Health Questionnaire, which was developed as a

screening instrument for detecting minor psychiatric disorders (Goldberg & Williams, 1991; Koeter & Ormel, 1991). The 4-point response scale can be scored in different ways. The GHQ method (0,0,1,1) was developed to identify individuals reporting sufficient psychological distress to be identified as probable cases of minor psychiatric disorder. The total number of times a person indicates that his or her psychological state is worse than usual is totaled, giving a scale score ranging from 0 to 12. The total score is used for case classification. In this study, a threshold of 3/4 was used to classify cases, that is subjects scoring adverse on 4 or more of the 12 items were designated as probable cases of minor psychiatric disorder. In the second scoring method, the Likert scoring method, a value of 0, 1, 2, or 3 is assigned to each response category and summed across all 12 items giving a continuous distribution of the total score ranging from 0 to 36. In the present study, both scoring methods were used.

Demographic and Health Factors. Information on gender, age, and educational level was obtained through answers to the respective questions in the questionnaire. Age was divided into five categories (see Table 1). Educational level was divided into seven categories (see Table 1). The questionnaire also included questions about the presence of long-term diseases and the self-rated general health status, adapted from the SF–36, which is a widely used generic health status measure (Aaronson et al., 1998). The general health status item was scored on a 5-point scale (see Table 2).

Work-Related Factors. In this study, work-related factors included decision latitude, psychological job demands, and the experience of strenuous work. Decision latitude was assessed with a validated Dutch version of the Job Content Questionnaire using the Decision Latitude scale (Houtman, 1995; Karasek, 1985). To determine the level of psychological job demands a validated Dutch version of the Psychological Job Demands scale of the Job Content Questionnaire (Houtman, 1995; Karasek, 1985) was used. For each scale, the total score was calculated by adding the responses to the items. The total score was then divided into tertiles, resulting in low, medium, and high levels of psychological job demands or decision latitude. A dichotomous item from a Dutch questionnaire on Work and Health (VAG; Gründemann, Smulders, & De Winter, 1993) rated the experience of strenuous work.

Statistical Analyses

Missing data on the Need for Recovery scale on more than four items resulted in excluding the complete scale from analysis. Sum scores with missing data on four or

TABLE 1
Need for Recovery From Work: Associations With Demographic Variables

Variable	*Need for Recovery (M)*	*SD*	*df*	*n*	*% Total Study*
Total study	38.13	26.90		12,015	100
Gender					
Male	38.82**	27.19	1	8,788	73
Female#	36.25	26.00		3,227	27
Age					
25 years	38.17	25.17	4	485	4
26–35 years	36.75*	25.80		3,026	25
36–45 years#	38.14	26.86		4,508	38
46–55 years	39.51*	27.93		3,489	29
56 years	36.66	27.60		507	4
Highest educational level					
Primary school	43.73**	30.35	6	517	4
Lower vocational school	40.24**	28.15		1,815	16
Lower secondary school	37.73	27.28		1,516	13
Intermediate vocational school#	36.59	26.40		2,780	24
Secondary school	37.20	26.51		1,003	9
Higher vocational school	37.69	26.16		2,694	23
University	38.08	25.45		1,332	11

Note. #Reference group.
*$p < 0.05$, **$p < 0.001$.

less items were calculated by dividing the score by the number of completed items. Missing data on the subscales "subjective fatigue" (2 items), "motivation" (1 item) and "concentration" (1 item) of the CIS questionnaires were replaced with the means of the specific scale. CIS questionnaires containing more than four missing items were excluded from analysis. Missing data in GHQ–12 questionnaires on three or less items were replaced with the item's means. Missing data on more than three items were excluded from further analysis.

Principal Components Analysis (PCA) was used to extract factors, the direct oblimin procedure to rotate factors, and the eigen value greater-than-one criterion was used to determine the number of factors. Further statistical procedures included Pearson correlation coefficients. Because the distribution of need for recovery was skewed to the left, Poisson regression analysis was the most adequate way to test statistical significant differences between the groups. In all analyses, differences were considered to be statistically significant at $p < .05$. Statistical analyses were performed with both the SPSS-package for Windows 9.0 (SPSS, 1998) and SAS (SAS, 1989).

TABLE 2
Need for Recovery From Work: Associations With Health Factors and Work-Related Factors

Variable	*Need for Recovery (M)*	*SD*	*df*	*n*	*% Total Study*
Total study	38.13	26.90		12,015	100
Long-term disease					
Yes	46.84**	27.76	1	2,818	24
No#	35.04	25.85		8,860	76
General health status					
Excellent	24.35**	20.43	4	1,136	9
Very good	27.64**	22.20		2,641	22
Good#	39.26	26.31		6,395	54
Moderate	57.84**	25.91		1,638	14
Bad	66.18**	25.51		121	1
Psychological job demands					
Low	27.08**	22.81	2	3,763	32
Medium#	37.50	25.93		3,793	33
High	49.04**	26.99		4,113	35
Decision latitude					
Low	44.11**	28.34	2	3,607	31
Medium#	35.79	26.28		3,735	31
High	35.34	25.40		4,543	38
Strenuous work					
Yes	48.77**	27.29	1	3,082	26
No#	34.46	25.77		8,861	74

Note. #Reference group.
**$p < 0.001$.

RESULTS

Need for Recovery From Work

The overall mean score of need for recovery in the total study population was 38.13 ($SD = 26.90$). As shown in Figure 1, need for recovery showed a continuous distribution with no cutoff point or rarity and some degree of need for recovery was found in nearly all employees. The distribution was skewed to the left.

Men reported a slightly higher need for recovery from work in comparison with women ($p < 0.001$) (See Table 1). With respect to age, the highest need for recovery was found among subjects aged 46–55 years. Poisson regression analysis indicated that employees aged 46–55 years scored higher on need for recovery than employees aged 36–45 years ($p < 0.05$). Employees aged 26–35 years

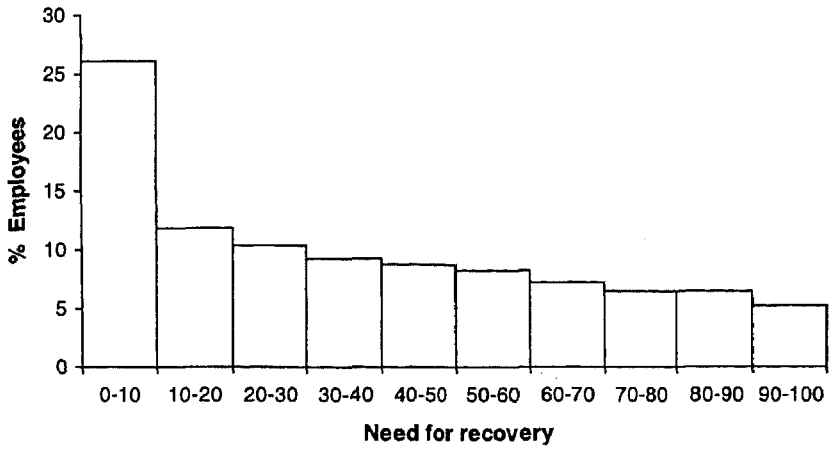

FIGURE 1 Need for recovery from work.

reported a significantly lower need for recovery than employees aged 36–45 years ($p < 0.05$).

Concerning educational level (see Table 1), need for recovery from work showed a curvilinear relationship with higher need for recovery in the lower and higher educational levels. Poisson regression analysis revealed that employees who only completed primary school or lower vocational school reported a significantly higher need for recovery than employees who completed intermediate vocational school ($p < 0.001$).

As presented in Table 2, employees reporting a long-term disease ($n = 2,818$) showed a substantial higher need for recovery after work ($p < 0.001$) than employees not reporting a long-term disease. Concerning self-rated general health status, employees rating their health status as moderate or bad, reported the highest need for recovery.

As shown in Table 2, employees with low psychological job demands reported substantially lower levels of need for recovery ($p < 0.001$) compared to employees experiencing medium psychological job demands. High psychological job demands resulted in substantial and significant higher levels of need for recovery ($p < 0.001$) compared to employees experiencing medium levels of psychological job demands. Employees reporting low decision latitude reported significantly more need for recovery than employees with medium levels of psychological job demands ($p < 0.001$). Employees experiencing their work as very strenuous reported a substantial

higher need for recovery ($p < 0.001$) than employees experiencing their work not as very strenuous.

Associations of Need for Recovery With Fatigue and Psychological Distress

Based on the total study population, the overall mean values of the Need for Recovery scale, CIS, and GHQ–12 (Likert-scoring) were 38.13 ($SD = 26.90$), 57.19 ($SD = 23.69$), and 11.61 ($SD = 5.36$), respectively. The Pearson correlation coefficient between need for recovery and CIS and GHQ–12 was 0.63 ($n = 11{,}790$; $p < 0.001$) and 0.48 ($n = 11{,}909$; $p < 0.001$), respectively.

TABLE 3
Comparison of "Cases" of Need for Recovery From Work, Fatigue and Psychological Distress

	Total (n)	*Need for Recovery +*	*CIS +*	*GHQ–12 +*
Need for recovery+	2.189	2,189	1,293	1,139
		(100%)	(59%)	(52%)
CIS +	2.595	1,293	2,595	1,473
		(50%)	(100%)	(57%)
GHQ – 12+	2.746	1,139	1,473	2,746
		(41%)	(54%)	(100%)
		Need for recovery+	*CIS +*	*GHQ –12 +*
Total (*n*)		2,189	2,595	2,746
Need for recovery		—	1,284	1,592
			(49%)	(58%)
CIS –		850	—	1,218
		(39%)		(44%)
GHQ – 12 –		1,214	1,100	—
		(55%)	(42%)	

Note. "Row totals of cases are not equal to 100%, due to missing values and overlapping between instruments". Need for recovery + = considerable need for recovery.

CIS+ = fatigue case. GHQ –12+ = psychological distress case; need for recovery = no considerable need for recovery. CIS– = no fatigue case. GHQ–12 – = no psychological distress case.

TABLE 4
Five-Factor Solution After Direct Oblimin Rotation

Need for Recovery Scale	*Factor 1*	*Factor 2*	*Factor 3*	*Factor 4*	*Factor 5*
1. I find it hard to relax at the end of a working day	.04	.08	*.54*	.16	.11
2. At the end of a working day I am really feeling worn-out	.25	.01	*.67*	.06	.12
3. My job causes me to feel rather exhausted at the end of a working day	.22	.02	*.69*	.06	.14
4. Generally speaking, I'm still feeling fresh after supper	.29	.03	*.56*	.12	.02
5. Generally speaking, I am able to relax only on a second day off	.11	.02	*.62*	.00	.01
6. I have trouble concentrating in the hours off after my working day	.09	.03	*.53*	.36	.05
7. I find it hard to show interest in other people when I just came home from work	.21	.05	*.69*	.10	.18
8. In general, it takes me over an hour to feel fully recovered after work	.04	.04	*.77*	.04	.02
9. When I get home, people should leave me alone for some time	.14	.03	*.70*	.01	.12
10. After a working day I am often too tired to start other activities	.22	.08	*.62*	.03	.04
11. During the last part of the working day I cannot optimally perform my job because of fatigue sometimes	.09	.04	.29	*.31*	.15
Checklist Individual Strength (CIS)					
1. I feel fit[a]	*.71*	.02	.06	.09	.18
2. I feel very active[b]	*.51*	.12	.06	.04	.40
3. Thinking requires effort[c]	.12	.10	.02	*.69*	.02
4. Physically I feel exhausted[a]	.72	.05	.09	.11	.04
5. I feel like doing all kind of nice things[b]	.17	.02	.10	.01	*.73*

(CONTINUED)

TABLE 4 (CONTINUED)

6. I feel tired[a]	*.75*	.10	.11	.10	.01
7. I do quite a lot within a day[d]	.06	*.87*	.04	.09	.06
8. When I am doing something, I can concentrate quite well[c]	.03	.14	.02	*.74*	.08
9. I feel weak[a]	*.68*	.08	.06	.16	.01
10. I don't do much during the day[d]	.03	*.86*	.04	.06	.09
11. I can concentrate well[c]	.03	.09	.04	*.78*	.10
12. I feel rested[a]	*.63*	.04	.14	.13	.15
13. I have trouble concentrating[c]	.10	.01	.01	*.78*	.04
14. Physically I am in a bad condition[a]	*.78*	.11	.04	.01	.01
15. I am full of plans[b]	.05	.04	.01	.03	*.79*
16. I am tired very quickly[a]	*.69*	.10	.07	.11	.03
17. I have a low output[d]	.14	*.60*	.04	.21	.02
18. I feel no desire to do anything[b]	.27	.17	.13	.17	*.39*
19. My thoughts easily wander[c]	.03	.09	.02	*.73*	.03
20. Physically I feel in a good shape[a]	*.76*	.07	.01	.02	.13

Note. Italicized numbers indicate the factor to which each item was assigned/highest factor loading. CIS = Checklist Individual Strength. [a] = subjective experience of fatigue item (CIS). [b] = reduced motivation item (CIS). [c] = reduced concentration item (CIS). [d] = reduced activity item (CIS).

As presented in Table 3, cases classified by the Need for Recovery scale and cases classified by the CIS and GHQ–12 can both be overlapping and exclusive. Of the employees, 38% ($n = 828$) reported significant need for recovery, fatigue, and psychological distress. When regarding caseness however, 25% of the employees with significant need for recovery ($n = 544$) reported significant need for recovery alone, without fatigue and psychological distress.

Principal Components Analysis

The Need for Recovery scale was examined, using PCA. Selection of the number of factors was based on the eigen value-greater-than one criterion and the use of the scree test. These criteria indicated a one-factor model for need for recovery that accounted for 46.7% of the total variance (Eigen value = 5.13).

PCA of the CIS yielded four factors in a population of patients with chronic fatigue syndrome (Vercoulen et al., 1994), which was replicated in the present study. To compare the Need for Recovery scale and the CIS, the 11 need-for-re-

TABLE 5
Two-Factor Solution After Direct Oblimin Rotation

Need For Recovery Scale	*Factor 1*	*Factor 2*
1. I find it hard to relax at the end of a working day	*.62*	.03
2. At the end of a working day I am really feeling worn-out	*.81*	.14
3. My job causes me to feel rather exhausted at the end of a working day	*.81*	.17
4. Generally speaking, I'm still feeling fresh after supper	*.73*	.06
5. Generally speaking, I am able to relax only on a second day off	*.69*	.07
6. I have trouble concentrating in the hours off after my working day	*.53*	.16
7. I find it hard to show interest in other people when I just came home from work	*.56*	.02
8. In general, it takes me over an hour to feel fully recovered after work	*.77*	.12
9. When I get home, people should leave me alone for some time	*.61*	.07
10. After a working day I am often too tired to start other activities	*.73*	.01
11. During the last part of the working day I cannot optimally perform my job because of fatigue sometimes	*.37*	.17
Checklist Individual Strength (CIS)		
1. I feel fit[a]	*.57*	.38
2. I feel very active[b]	.42	*.47*
3. Thinking requires effort[c]	.20	*.49*
4. Physically I feel exhausted[a]	*.59*	.23
5. I feel like doing all kind of nice things[b]	.30	*.36*
6. I feel tired[a]	*.65*	.22
7. I do quite a lot within a day[d]	.30	*.69*
8. When I am doing something, I can concentrate quite well[c]	.05	*.71*
9. I feel weak[a]	*.52*	.38
10. I don't do much during the day[d]	.15	*.73*
11. I can concentrate well[c]	.09	*.72*
12. I feel rested[a]	*.61*	.31
13. I have trouble concentrating[c]	.17	*.60*
14. Physically I am in a bad condition[a]	*.47*	.36
15. I am full of plans[b]	.11	*.45*

(CONTINUED)

TABLE 5 (CONTINUED)		
16. I am tired very quickly[a]	*.53*	.38
17. I have a low output[d]	.03	*.70*
18. I feel no desire to do anything[b]	.34	*.51*
19. My thoughts easily wander[c]	.13	*.61*
20. Physically I feel in a good shape[a]	*.49*	.34

Note. Italicized numbers indicate the factor to which each item was assigned/highest factor loading. [a] = subjective experience of fatigue item (CIS). [b] = reduced motivation item (CIS). [c] = reduced concentration item (CIS). [d] = reduced activity item (CIS).

covery items and the 20 CIS items were analyzed in a PCA with oblique rotation. Setting an eigen value greater-than-one and the scree test as criterions for retaining components, PCA yielded five factors (see Table 4). The first factor accounted for 39.3% of the variance and consisted of the eight subjective fatigue items of the CIS and one motivation item. The second factor explained 8.4% of the variance and captured the three reduced-activity items of the CIS. The third factor accounted for 5.3% of the variance and consisted of 10 out of 11 items from the Need for Recovery scale. The fourth factor explained 4.3% of the variance and consisted of the five concentration items of the CIS. Finally, the fifth factor accounted for 3.6% of the variance and consisted of three out of four reduced motivation items of the CIS. In this five-factor solution no substantial cross-loading was observed. Double loading was operationalized as secondary loadings of 0.40 or greater. In this five-factor solution one double-loading item was observed (see Table 4).

To investigate whether need for recovery and CIS really assess two different underlying concepts, the need for recovery and CIS items were analyzed in a two-factor solution (see Table 5). The first and second factor accounted for 39.3% and 8.4% of the variance, respectively. In this two-factor solution, the first factor captured all need for recovery items and all subjective fatigue items of the CIS. The second factor captured all other CIS items. One double-loading item was observed in these CIS items (see Table 5). All subjective fatigue items from the CIS cross-loaded with factor 1. Therefore, the subjective fatigue and need for recovery items were jointly analyzed in PCA, indicating a two-factor solution. The first factor captured all need for recovery items, the second factor captured all subjective fatigue items. No cross-loading or double-loading items were observed.

The Need for Recovery scale and the CIS use different response formats. Therefore, the possibility exists that the observed factors are simply response scale factors. To investigate this possibility, the response scale of the CIS was reduced to dichotomous items. Values 1, 2, and 3 of the 7-point Likert scale were replaced by

value 1. The middle value (4) was recoded as a missing value, because it cannot be categorized in a dichotomized scale. Values 5, 6, and 7 were replaced by value 0. Using this revised scoring method, PCA revealed similar factors as previously obtained with regard to the five-factor model. The two-factor model however yielded a stronger separation between the need for recovery items and the CIS-items when using this revised scoring method.

Explorative PCA of the GHQ–12 revealed two factors, replicating the findings of earlier studies in different populations (Politi, Piccinelli, & Wilkinson, 1994; Schmitz, Kruse, & Tress, 1999). To compare the Need for Recovery scale and the GHQ–12, the need for recovery items and the GHQ–12 items were analyzed in a PCA with oblique rotation. A three-factor solution was indicated. The first factor explained 34.7% of the variance and consisted of nine GHQ–12 items. The second factor explained 12.7% of the variance and consisted of the 11 need for recovery items. The third factor accounted for 4.6% of the variance and consisted of three GHQ–12 items. No double-loading or cross-loading items were observed.

To investigate whether need for recovery and psychological distress actually represent two different underlying concepts, the need for recovery and GHQ–12 items were analyzed in a two-factor solution. The first factor accounted for 34.7% of the variance and consisted of the 12 GHQ–12 items. The second factor explained 12.7% of the variance and consisted of the 11 need for recovery items. No double-loading or cross-loading items were observed.

The Need for Recovery scale and the GHQ–12 also use different response formats. To investigate the possibility of response scale factors, the response scale of the GHQ was reduced to dichotomous variables, using the GHQ method (0, 0, 1, 1). Using this revised scoring method, PCA revealed similar factors as previously obtained.

DISCUSSION

In this study, the concept of need for recovery in the working population was explored. In addition, the association between need for recovery from work, fatigue, and psychological distress in the working population was reported.

The distribution of need for recovery showed no cutoff point or rarity, and some degree of need for recovery from work was found in nearly all employees. The overall mean level of need for recovery was higher than that found in a study by Sluiter et al. (2001). However, the sample size in the study by Sluiter et al. (2001) was relatively small compared to the sample size in the present study. The skewed distribution of need for recovery is comparable to what others have found and is not unusual for a scale measuring symptoms (Van Veldhoven & Broersen, 1999). Regarding fatigue, some degree of fatigue was present in almost every employee

in the Maastricht Cohort Study (Bültmann et al., 2001), which is in line with other studies examining fatigue in the general population and primary care (David et al., 1990; Loge, Ekeberg, & Kaasa, 1998). The overall mean score of psychological distress is also comparable to other studies (McCabe, Thomas, Brazier, & Coleman, 1996). These findings were obtained by participants of 45 different companies. Our response rate of 45% raises the question of a possible selective response. A nonresponse analysis revealed that nonrespondents were somewhat less likely to report fatigue complaints, sick leave, and difficulties in work execution. Therefore, the observed prevalence of fatigue in this study could be a slight overestimation, and it is therefore likely that the prevalences of need for recovery and psychological distress could also be slightly overestimated. However, we argue that these potential overestimations have not affected the presented associations between need for recovery and demographic, health, and work-related factors, because overestimation probably will not have influenced the distribution of need for recovery in the cohort.

Need for recovery from work was higher in men than in women. However, because the difference was that small, significant findings may be due to sample size. Need for recovery was higher in the higher age groups, as others have found (Van Veldhoven & Broersen, 1999). Need for recovery was highest in the group of employees who only completed primary school and lowest in the group of employees who completed intermediate vocational school. In a study by Van Veldhoven and Broersen, (1999) it was found that need for recovery increased with increasing educational level. In the present study, need for recovery increased when employees completed intermediate vocational school or more. However, the differences in need for recovery with increasing educational level were not statistically significant. These different findings between the two studies can possibly be explained by different operationalizations of categories of educational level or by differences in the composition of the study population. Furthermore, when interpreting the association between need for recovery and educational level one has to keep in mind that within one group of educational level different aspects of job position and content of work may be represented. Thus, when regarding demographic factors associated with need for recovery, one has to consider that these associations are influenced by many other factors, such as work-related and non-work-related factors and the private situation.

Employees reporting a long-term disease showed a substantial higher need for recovery from work than employees not reporting a long-term disease. Concerning self-rated general health status, employees rating their health status as "moderate" or "bad," reported the highest need for recovery. These findings support the notion that health status plays an important role in need for recovery. Employees with low psychological job demands reported substantially lower levels of need for recovery compared to employees experiencing medium psychological job demands. High psychological job demands resulted in substan-

tially more need for recovery. Employees reporting low decision latitude had a significantly higher need for recovery than employees with medium levels of psychological job demands, suggesting that the concept of need for recovery may be applicable to recovery from different work-related stressors. Another study also revealed that employees reporting more job demands also reported more need for recovery after work (Sluiter, et al., 2001). Employees experiencing their work as very strenuous reported a substantial higher need for recovery compared with those experiencing their work as not very strenuous. Although need for recovery seems to be associated with health status and subjective work experience, one should be cautious when interpreting these results, because both exposure and effect are assessed in a cross-sectional study, in which cause and effect are difficult to separate.

To date, there are no existing cutoff points for classifying cases with a marked need for recovery from work, putting them at risk for future health problems. Therefore, in the present study the upper quartile was used to define a contrast between employees with and without considerable need for recovery, which so far appeared to be a good method because the distribution of need for recovery in the cohort covered the whole range of the scale and showed no cutoff point or rarities. However, definition and validation of a cutoff point for need for recovery is needed for actual classification of cases.

An association between need for recovery from work, fatigue, and psychological distress in the working population was observed regarding overlapping cases. In the present study, 59% of the employees reporting significant need for recovery also reported fatigue, even as 52% of the employees reporting considerable need for recovery also reported psychological distress. Of course, similar items used in the three instruments can explain some degree of overlap. Other studies (Bültmann et al., 2001; Kirk, Hickie, & Martin, 1999) found an association between fatigue and psychological distress as well. When regarding caseness, need for recovery alone was still reported by 25% of the employees. Thus, although need for recovery, fatigue, and psychological distress were frequently comorbid, they also clearly occurred as separate entities.

PCA indicated a distinction between need for recovery and prolonged fatigue. Of interest are the CIS items relating to subjective fatigue, which are demonstrated in the two-factor solution to be strongly related to both the need for recovery factor and the subjective fatigue factor. The presence of these subjective fatigue CIS items in a primarily based need for recovery factor is not unexpected, as they represent the subjective experience of fatigue, as opposed to the other CIS items that are more concerned with concentration, motivation, and activity aspects of fatigue. Classification as a "fatigue case," however, depends on scoring on more dimensions than simply the general fatigue dimension.

When forcing the need-for-recovery items and GHQ–12 items in a two-factor model, the items of the two instruments were clearly separated, which supports the

notion of different underlying concepts. A step beyond the scope of the present findings concerns longitudinal research. If longitudinal investigations in the future are able to discriminate further between the concepts of need for recovery, fatigue, and psychological distress, perhaps it will be possible to put the three concepts on a continuum, starting with need for recovery, followed by fatigue and/or psychological distress. So far, directly associating need for recovery and psychological distress seems a bridge too far. In another study (Bültmann et al., 2001) fatigue and psychological distress were fairly well associated. Perhaps need for recovery should be considered as a precursor of prolonged fatigue in the working environment, in which need for recovery represents the more acute effects of a day of work and fatigue, as assessed by the CIS, representing the more prolonged effects. On the other hand, it may as well be so that prolonged fatigue lowers the resistance against daily workloads, and consecutively, increases the need for recovery during time.

When regarding the concept of need for recovery from work, working time arrangements are of interest, because working time arrangements provide employees the actual time to recover from work. Perhaps need for recovery could constitute a good measure when studying the effects of working time arrangements in the short term.

Our findings confirm that need for recovery is related to several work-related factors, demographic factors, as well as to health status. This study shows that need for recovery, fatigue, and psychological distress are frequently comorbid. However, evidence of different underlying concepts was also found. Whether or not these three "conditions" also occur at different periods in time has to be examined further and requires a longitudinal approach. Longitudinal research also has to clarify whether employees with a high need for recovery are at risk for future health problems, including prolonged fatigue and sick leave. If this proves to be the case, then need for recovery could be an important tool for early detection of employees at risk for prolonged fatigue in the work environment.

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